SENSORS CONVERGE – THE TE CONNECTIVITY MS8607 PRESSURE HUMIDITY TEMPERATURE SENSOR

Introduction

The TE Connectivity MS8607 is a digital combination sensor, providing three environmental physical measurements all-in-one: pressure, humidity, and temperature (PHT).

- Integrated pressure, humidity and temperature sensor
- QFN package 5 x 3 x 1 mm^3
- Operating range: 10 to 2000 mbar, 0%RH to 100%RH, -40 to 85 °C
- High-resolution module: 0.016 mbar, 0.04%RH, 0.01°C
- Supply voltage: 1.5 to 3.6 V
- Fully factory calibrated sensor
- I2C interface

Use Cases

There are many different applications where fast accurate ToF measurements can be leveraged . . .

- Smart phones and Tablet PCs
- HVAC applications
- Weather stations
- Printers
- Home appliance and humidifiers
- What use cases can you think of?

Lab Objectives

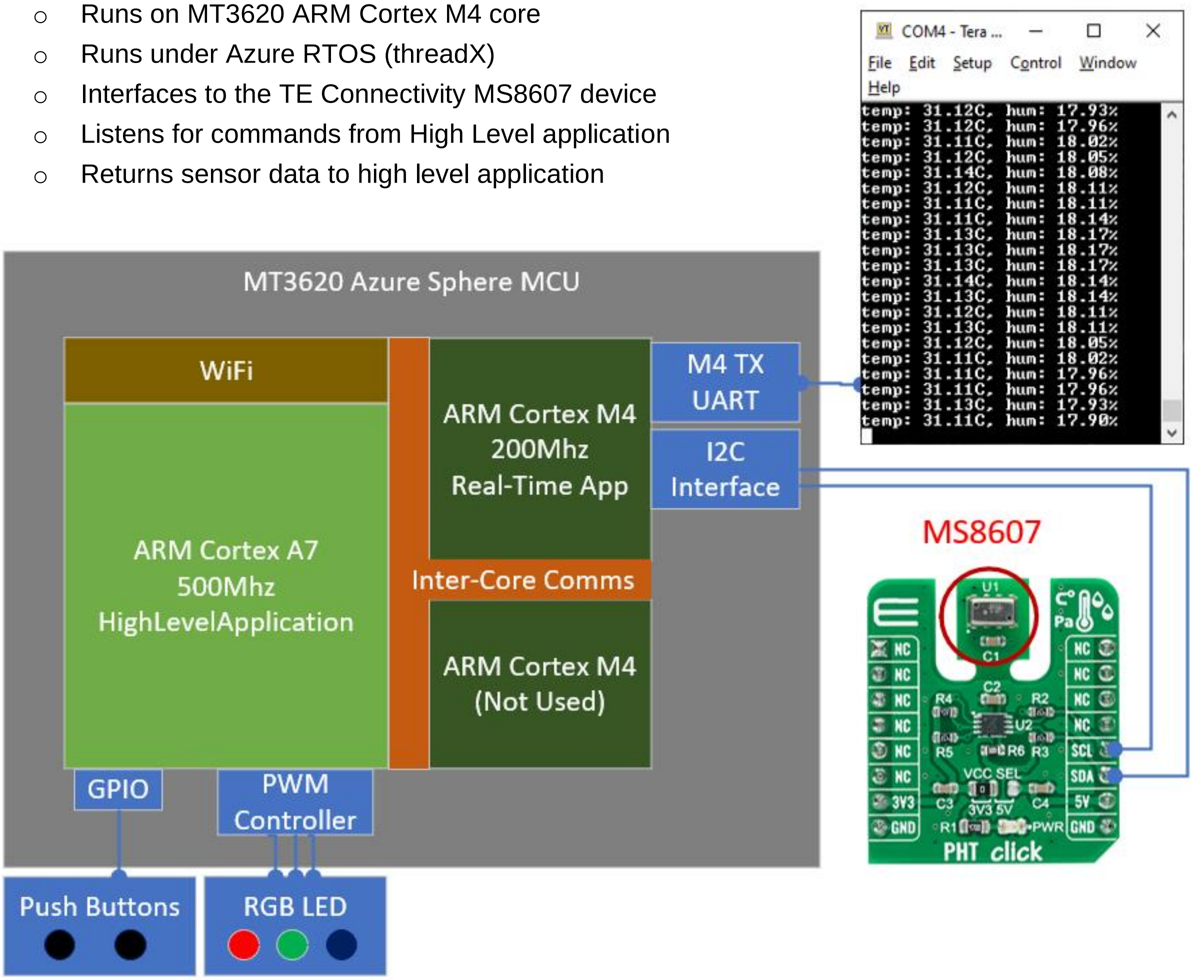
- Learn about the TE Connectivity MS8607
- Configure an Avnet Azure Sphere Starter Kit with a MS8607 device
- Install pre-built applications onto the Starter Kit
- Interact with the MS8607 sensor

Prerequisites

- Avnet Azure Sphere Starter Kit
- MikroE PHT Click board
- Azure Sphere SDK installed on laptop
    - Windows or Linux

Demo Architecture

- High Level application
    - Runs on MT3620 ARM Cortex A7 core
    - Runs under the Azure Sphere Linux OS
    - Periodically requests temperature data from the RTApp
    - Drives PWM outputs
- Real-time application
    - Runs on MT3620 ARM Cortex M4 core
    - Runs under Azure RTOS (threadX)
    - Interfaces to the TE Connectivity MS8607 device
    - Listens for commands from High Level application
    - Returns sensor data to high level application



```
temp: 31.12C, hum: 17.93%
temp: 31.12C, hum: 17.96%
temp: 31.11C, hum: 18.02%
temp: 31.12C, hum: 18.05%
temp: 31.14C, hum: 18.08%
temp: 31.12C, hum: 18.11%
temp: 31.11C, hum: 18.11%
temp: 31.11C, hum: 18.14%
temp: 31.13C, hum: 18.17%
temp: 31.13C, hum: 18.17%
temp: 31.13C, hum: 18.17%
temp: 31.14C, hum: 18.14%
temp: 31.13C, hum: 18.14%
temp: 31.12C, hum: 18.11%
temp: 31.13C, hum: 18.11%
temp: 31.12C, hum: 18.05%
temp: 31.11C, hum: 18.02%
temp: 31.11C, hum: 17.96%
temp: 31.11C, hum: 17.96%
temp: 31.13C, hum: 17.93%
temp: 31.11C, hum: 17.90%
```

Application Details

The example we'll run today consists to two different applications running on an MT3620 Azure Sphere MCU. The applications communicate through an inter-core communication path provided by the Azure Sphere SDK/OS.

Real-Time Application

The application running on the M4 core is an Azure RTOS (threadX) application. The real-time application code can be found on GitHub here, under /Examples/AvnetPHTClick-RTApp/.

Application pseudocode:

```
•  Initialize hardware
•  Initialize Inter-Core communication path
•  Wait for high level application command
    o  Read sensor
    o  Return Data to high level application
    o  Output sensor data to M4 UART
```

High-Level Application

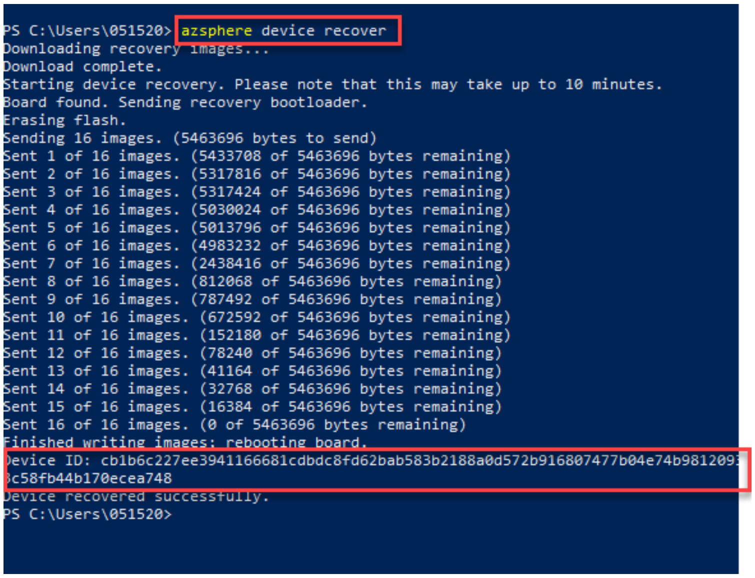
The application running on the A7 High Level core is a POSIX application running on the Azure Sphere Linux OS. The high-level application code can be found on GitHub here.

Application pseudocode:

```
•  Initialize hardware
•  Initialize global variables
•  Determine room temperature
    o  Turn all RGB elements on 100%
    o  Sample 32 temperature readings
    o  Use average for "room temperature"
    o  Turn off all RGB element
•  While (true)
    o  If either of the user buttons are pressed
        ▪  Determine room temperature
    o  Send command to real-time app to read sensor
    o  Catch the sensor data
        ▪  If temperature data is > room temperature
            •  Light the RED LED
        ▪  If temperature data < room temperature
            •  Light the BLUE LED
        ▪  If temperature == room temperature
            •  Turn off all LEDs
```

Lab Instructions

1. Download the workshop package from https://avnet.me/sensorConvergeSphereWorkshop
2. Unpack your new Avnet Azure Sphere Starter Kit
3. Unpack the pht Click board
    a. Insert the pht Click board into either of the MikroE BUS sockets with the MS8607 sensor closest to the edge of the Starter Kit
4. Connect the Starter Kit to your development PC using the provided micro-USB cable
5. Update your device to the latest OS (**Note: if you've already done this step it can be skipped**)
    a. Open a command shell
    b. Enter the recover command > **azsphere device recover**
    c. Verify that the images are updated and the device ID is read after the board reboots

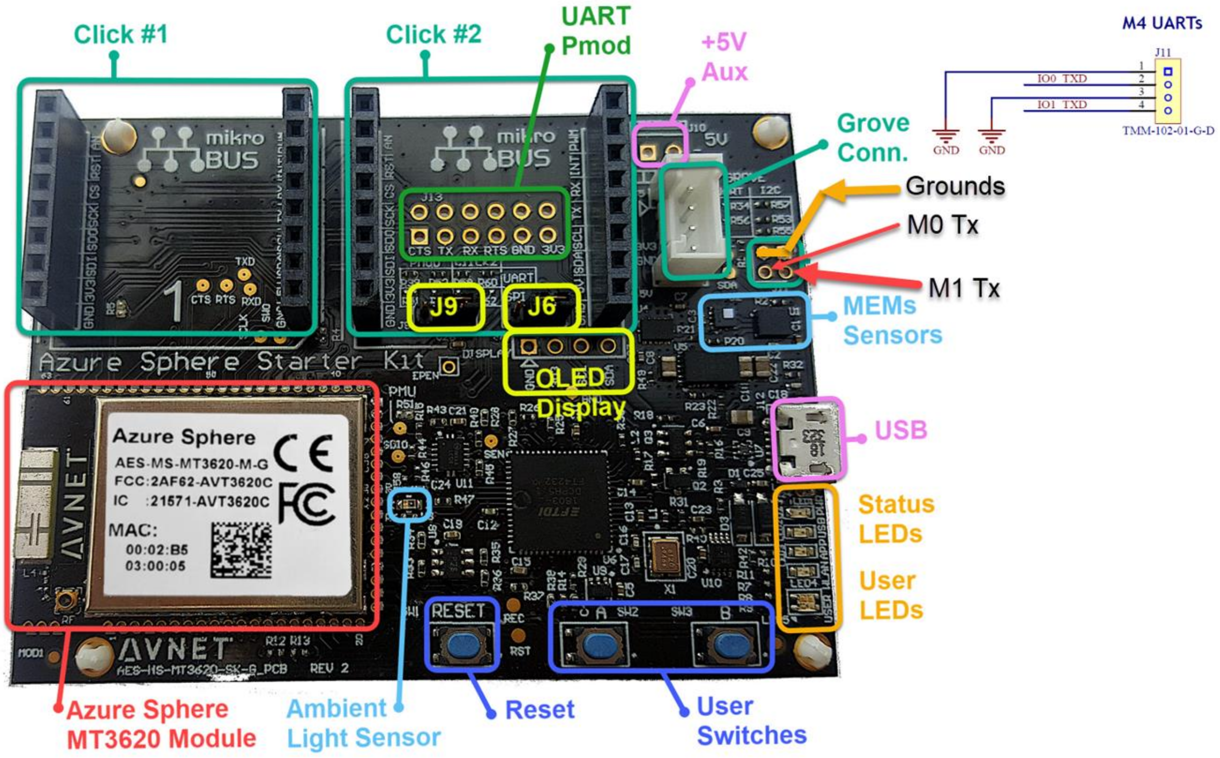


```
PS C:\Users\051520> azsphere device recover
Downloading recovery images...
Download complete.
Starting device recovery. Please note that this may take up to 10 minutes.
Board found. Sending recovery bootloader.
Erasing flash.
Sending 16 images. (5463696 bytes to send)
Sent 1 of 16 images. (5433708 of 5463696 bytes remaining)
Sent 2 of 16 images. (5317816 of 5463696 bytes remaining)
Sent 3 of 16 images. (5317424 of 5463696 bytes remaining)
Sent 4 of 16 images. (5030024 of 5463696 bytes remaining)
Sent 5 of 16 images. (5013796 of 5463696 bytes remaining)
Sent 6 of 16 images. (4983232 of 5463696 bytes remaining)
Sent 7 of 16 images. (2438416 of 5463696 bytes remaining)
Sent 8 of 16 images. (812068 of 5463696 bytes remaining)
Sent 9 of 16 images. (787492 of 5463696 bytes remaining)
Sent 10 of 16 images. (672592 of 5463696 bytes remaining)
Sent 11 of 16 images. (152180 of 5463696 bytes remaining)
Sent 12 of 16 images. (78240 of 5463696 bytes remaining)
Sent 13 of 16 images. (41164 of 5463696 bytes remaining)
Sent 14 of 16 images. (32768 of 5463696 bytes remaining)
Sent 15 of 16 images. (16384 of 5463696 bytes remaining)
Sent 16 of 16 images. (0 of 5463696 bytes remaining)
Finished writing images; rebooting board.
Device ID: cb1b6c227ee3941166681cdbdc8fd62bab583b2188a0d572b916807477b04e74b9812093
3c58fb44b170ecea748
Device recovered successfully.
PS C:\Users\051520>
```

    d. If the command times out and fails to read the Device ID
        i. See the troubleshooting documentation here.

6. Connect your USB Serial Port to the board, this will allow us to monitor debug from the AzureRTOS application, use the M1 TX signal closest to the edge for the RX pin on your USB cable.

Signal	Serial Port Cable	Starter Kit
M4 Transmit Data	White (RX)	M1 (TX)
Ground	Black (GRD)	Any valid ground on the Starter Kit



7. Open a serial port terminal application such as TeraTerm or Putty
    a. Set the serial port to 115,200, 8, N, 1
    b. Set the terminal emulation to VT100

8. Sideload the pre-built applications onto the device

    a. Open a command shell such as the Windows PowerShell

    b. Open the folder where you copied the workshop files

    c. Change to the TMF8801 folder

        i. **cd MS8607**

    d. Copy the real-time application to the device

        i. > **azsphere device sideload deploy --image AvnetPhtClick -Workshop-V1-signed.imagepackage**

    e. Copy the high-level application to the device

        i. > **azsphere device sideload deploy --image avnet_sensors_converge_MS8607_HLApp-V1-signed.imagepackage**

    f. If you loaded the high level app first, hit the Starter Kit reset button

9. Exercise the sensor

    a. Observe the RGB LED

    b. Heat the sensor up by touching it with your finger

        i. Observe the debug output

        ii. Observe RGB LED

    c. Remove your finger and allow the sensor to cool down

        i. Observe the debug output

        ii. Observe the RGB LED

Questions?

Additional Resources

- TE Connectivity MS8607 Data Sheet
- PHT Click board documentation
- Azure Sphere Training Plan
    - Videos and training materials to bring a developer up to speed with the Azure Sphere solution and Azure Sphere Software Development

REVISION HISTORY

Revision	Date	Note
V1	4/7/2022	Initial document